

1. A permeable material having a permeability of at least about 50 cD
characterized by the material being resin-bonded and made from a composition
comprising:
 - 5 a) a refractory aggregate;
 - b) 0.5-15 wt.% of at least one oxygen getter; and
 - c) a sufficient amount of binder.
2. The permeable material of claim 1, characterized by the refractory aggregate
comprising at least 80 wt.% of the composition, and the refractory aggregate
10 including:
 - a) at least about 60 wt.% aggregate having a particle size of +80 mesh or
higher;
 - b) less than 20 wt.% aggregate having a particle size of -80 to +325 mesh; and
 - c) less than 20 wt.% aggregate having a particle size less than -325 mesh.
- 15 3. The permeable material of claim 2, characterized by the refractory aggregate
comprising at least one oxide selected from the group consisting of alumina,
magnesia, silica, zirconia, calcia, and mixtures and compounds thereof.
4. The permeable material of any one of the preceding claims, characterized by the
oxygen getter comprising at least one compound selected from the group
20 consisting of boron compounds, carbides, nitrides, and reactive metals.
5. The permeable material of claim 4, characterized by the reactive metal being
selected from the group consisting of aluminum, magnesium, silicon, titanium,
and mixtures and alloys thereof.
6. The permeable material of any one of the preceding claims, characterized by the

carbonaceous binders, starch, and ligno-sulfonates.

7. The permeable material of any one of the preceding claims, characterized by the composition comprising a fugitive additive capable of increasing permeability during heating of the permeable material.
8. The permeable material of claim 7, characterized by the fugitive additive comprising an organic compound.
9. The permeable material of any one of the preceding claims, characterized by the permeable material lining at least an inner surface of a refractory nozzle for use in the casting of molten metal, wherein the nozzle includes an inlet, an outlet, an outer surface, the inner surface defining a bore fluidly connecting the inlet and the outlet, and a top surface surrounding the inlet, the nozzle adapted to receive a flow of inert gas and comprising an impermeable material surrounding at least a portion of the permeable composition and substantially preventing diffusion of gases through the outer surface.
10. The permeable material of claim 9, characterized by the impermeable material being selected from the group consisting of metal and an impermeable refractory composition.
11. The permeable material of any one of claims 9 and 10, characterized by the impermeable refractory composition being made from a composition comprising 50-90 wt.% refractory aggregate, 1-10 wt.% binder, and 0.5-15 wt.% reactive metal.
12. The permeable material of any one of claims 9-11, characterized by the impermeable composition comprising 65-80 wt.% fused alumina, 2-30 wt.%

- wt.% zirconia, and less than 3 wt.% silica.
13. The permeable material of any one of claims 9-12, characterized by the nozzle including an inert gas delivery system.
- 5 14. The permeable material of claim 13, characterized by the gas delivery system being selected from the group consisting of channels, grooves and devices.
15. The permeable material of any one of the claim 9-14, characterized by the nozzle being made by:
- a) placing a first composition adapted to be the permeable material around a
- 10 mandrel in a mold;
- b) placing a second composition adapted to be the impermeable composition at least partially around the first composition;
- c) pressing the first and second compositions together at a pressure of at least about 3000 psi to form a green piece;
- 15 d) curing the green piece at a temperature less than 800°C to form the nozzle.
16. The permeable material of claim 15, characterized by the first composition comprising:
- a) at least 80 wt.% refractory aggregate including a least about 60 wt.% aggregate having a particle size of +80 mesh or higher, less than 20 wt.%
- 20 aggregate having a particle size of -80 and +325 mesh, and less than 20 wt.% aggregate having a particle size less than -325 mesh;
- b) 0.5-15 wt.% of at least one oxygen getter; and
- c) a sufficient amount of binder.
17. The permeable material of claim 16, characterized by the second composition

- a) 50-90 wt.% refractory aggregate;
- b) 1-10 wt.% binder; and
- c) 0.5-15 wt.% reactive metal